ETF liquidity 202: Beyond the basics

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Head of product and ETF capital markets
Vanguard Investments Canada Inc.

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About Vanguard

The Vanguard Group, Inc.
- **Founded:** 1975
- **Corporate headquarters:** Valley Forge, Pennsylvania, United States
- **Total assets:** $4.1 trillion worldwide
- **Number of products:** More than 250 mutual funds and ETFs worldwide

Vanguard Investments Canada Inc.
- **Founded:** December 2011
- **Headquarters:** Toronto, Ontario, Canada
- **Total assets:** $4.7 billion
- **Number of products:** 21 ETFs listed on Toronto Stock Exchange

As of March 31, 2015. Note: All assets are in CAD.
Source: The Vanguard Group, Inc.
Morningstar Awards 2014©. Morningstar, Inc. All Rights Reserved. Awarded to Vanguard Investments Canada Inc. for Best Equity ETF in Canada in 2013, and awarded to Vanguard Investments Canada Inc. for ETF Provider of the Year in Canada in 2013 and 2014. For further information about the Morningstar Awards, including information relating to the criteria upon which the awards are based, please visit www.investmentawards.com.
### Agenda

<table>
<thead>
<tr>
<th>Vanguard's Canadian ETF platform</th>
<th>ETF trading and liquidity basics</th>
<th>How market makers price ETFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond ETF premiums and discounts</td>
<td>A market maker’s balance sheet</td>
<td>ETF structures and total cost of ownership</td>
</tr>
<tr>
<td>Trading best practices and key takeaways</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Vanguard ETFs™: Equities

<table>
<thead>
<tr>
<th>ETF</th>
<th>Ticker</th>
<th>Index</th>
<th>MGMT fee¹/MER²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canadian equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTSE Canada Index ETF</td>
<td>VCE</td>
<td>FTSE Canada Index</td>
<td>0.05%/0.09%</td>
</tr>
<tr>
<td>FTSE Canada All Cap Index ETF</td>
<td>VCN</td>
<td>FTSE Canada All Cap Index</td>
<td>0.05%/0.11%</td>
</tr>
<tr>
<td>FTSE Canadian High Dividend Yield Index ETF</td>
<td>VDY</td>
<td>FTSE Canada High Dividend Yield Index</td>
<td>0.20%/0.30%</td>
</tr>
<tr>
<td>FTSE Canadian Capped REIT Index ETF</td>
<td>VRE</td>
<td>FTSE Canada All Cap Real Estate Capped 25% Index</td>
<td>0.35%/0.39%</td>
</tr>
<tr>
<td><strong>U.S. equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Total Market Index ETF</td>
<td>VUN</td>
<td>CRSP US Total Market Index</td>
<td>0.15%/0.16%</td>
</tr>
<tr>
<td>U.S. Total Market Index ETF (CAD-hedged)</td>
<td>VUS</td>
<td>CRSP US Total Market Index (CAD-hedged)</td>
<td>0.15%/0.16%</td>
</tr>
<tr>
<td>S&amp;P 500 Index ETF</td>
<td>VFV</td>
<td>S&amp;P 500 Index</td>
<td>0.08%*/0.13%</td>
</tr>
<tr>
<td>S&amp;P 500 Index ETF (CAD-hedged)</td>
<td>VSP</td>
<td>S&amp;P 500 Index (CAD-Hedged)</td>
<td>0.08%*/0.13%</td>
</tr>
<tr>
<td>U.S. Dividend Appreciation Index ETF</td>
<td>VGG</td>
<td>NASDAQ US Dividend Achievers Select Index</td>
<td>0.28%/0.29%</td>
</tr>
<tr>
<td>U.S. Dividend Appreciation Index ETF (CAD-hedged)</td>
<td>VGH</td>
<td>NASDAQ US Dividend Achievers Select Index (CAD-hedged)</td>
<td>0.28%/0.29%</td>
</tr>
<tr>
<td><strong>International equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTSE All-World ex Canada Index ETF</td>
<td>VXC</td>
<td>FTSE All-World ex Canada Index</td>
<td>0.25%/0.27%</td>
</tr>
<tr>
<td>FTSE Developed ex North America Index ETF</td>
<td>VDU</td>
<td>FTSE Developed ex North America Index</td>
<td>0.20%*/0.26%</td>
</tr>
<tr>
<td>FTSE Developed ex North America Index ETF (CAD-hedged)</td>
<td>VEF</td>
<td>FTSE Developed ex North America Index Hedged CAD Index</td>
<td>0.20%*/0.27%</td>
</tr>
<tr>
<td>FTSE Developed Europe Index ETF</td>
<td>VE</td>
<td>FTSE Developed Europe Index</td>
<td>0.23%/0.23%</td>
</tr>
<tr>
<td>FTSE Developed Asia Pacific Index ETF</td>
<td>VA</td>
<td>FTSE Developed Asia Pacific Index</td>
<td>0.23%/0.23%</td>
</tr>
<tr>
<td>FTSE Emerging Markets Index ETF</td>
<td>VEE</td>
<td>FTSE Emerging Index</td>
<td>0.23%*/0.29%</td>
</tr>
</tbody>
</table>

¹ The management fee is equal to the fee paid by the Vanguard ETF to Vanguard Investments Canada Inc., and does not include applicable taxes or other fees and expenses of the Vanguard ETF. For any Vanguard ETF which invests in another Vanguard fund, the management fee also includes any fees paid to Vanguard Investments Canada Inc. or its affiliates by such other Vanguard fund as well as certain expenses of the other Vanguard fund that are paid directly by the other Vanguard fund. Vanguard Investments Canada Inc. will not receive a fee in respect of its provision of services as trustee.

² The MER is the audited MER as of December 31, 2014 including waivers and absorptions and is expressed as an annualized percentage of the daily average net asset value. The MER without any absorptions or waivers would have been 0.09% for VCE, 0.11% for VCN, 0.31% for VDY, 0.40% for VRE, 0.16% for VUN, 0.16% for VUS, 0.13% for VFV, 0.14% for VSP, 0.30% for VGG, 0.31% for VGH, 0.30% for VXC, 0.27% for VDU, 0.27% for VEF, 0.29% for VE, 0.32% for VA, and 0.29% for VEE. Vanguard Investments Canada Inc. expects to continue absorbing or waiving certain fees indefinitely, but may, in its discretion, discontinue this practice at any time.

* As of October 7, 2014, the management fee for VCE was reduced from 0.09% to 0.05%; for VCN from 0.12% to 0.05%; for VDY from 0.30% to 0.20%; for VFV and VSP from 0.15% to 0.08%; for VDU and VEF from 0.28% to 0.20%; and VEE from 0.33% to 0.23%.
### Vanguard ETFs: Fixed income

<table>
<thead>
<tr>
<th>ETF</th>
<th>Ticker</th>
<th>Index</th>
<th>MGMT fee¹/MER²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canadian fixed income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canadian Aggregate Bond Index ETF</td>
<td>VAB</td>
<td>Barclays Global Aggregate Canadian Float Adjusted Bond Index</td>
<td>0.12%/0.19%</td>
</tr>
<tr>
<td>Canadian Short-Term Bond Index ETF</td>
<td>VSB</td>
<td>Barclays Global Aggregate Canadian Gov/Cr 1-5Yr Float Adjusted Bond Index</td>
<td>0.10%/0.15%</td>
</tr>
<tr>
<td>Canadian Short-Term Corporate Bond Index ETF</td>
<td>VSC</td>
<td>Barclays Global Aggregate Canadian Credit 1-5 year Float Adjusted Bond Index</td>
<td>0.10%/0.15%</td>
</tr>
<tr>
<td><strong>U.S. fixed income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Aggregate Bond Index ETF (CAD-hedged)</td>
<td>VBU</td>
<td>Barclays U.S. Aggregate Float Adjusted Bond Index (CAD Hedged)</td>
<td>0.20%/0.20%</td>
</tr>
<tr>
<td><strong>International fixed income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global ex-U.S. Aggregate Bond Index ETF (CAD-hedged)</td>
<td>VBG</td>
<td>Barclays Global Aggregate ex-USD Float Adjusted RIC Capped Index (CAD Hedged)</td>
<td>0.35%/0.35%</td>
</tr>
</tbody>
</table>

¹ The management fee is equal to the fee paid by the Vanguard ETF to Vanguard Investments Canada Inc., and does not include applicable taxes or other fees and expenses of the Vanguard ETF. For any Vanguard ETF which invests in another Vanguard fund, the management fee also includes any fees paid to Vanguard Investments Canada Inc. or its affiliates by such other Vanguard fund as well as certain expenses of the other Vanguard fund that are paid directly by the other Vanguard fund. Vanguard Investments Canada Inc. will not receive a fee in respect of its provision of services as trustee.

² The MER is the audited MER as of December 31, 2014, including waivers and absorptions and is expressed as an annualized percentage of the daily average net asset value. The MER without any absorptions or waivers would have been 0.20% for VAB, 0.15% for VSB, 0.15% for VSC, 0.33% for VBU, and 0.44% for VBG. Vanguard Investments Canada Inc. expects to continue absorbing or waiving certain fees indefinitely, but may, in its discretion, discontinue this practice at any time.

* As of October 7, 2014, the management fee for VAB was reduced from 0.20% to 0.12%, VSB was reduced from 0.15% to 0.10%, and VSC was reduced from 0.15% to 0.10%.
Vanguard sample ETF portfolio strategy
Balanced growth portfolio: 60% equity / 40% fixed income

<table>
<thead>
<tr>
<th>Canada allocation</th>
<th>Equity allocation</th>
<th>Fixed income allocation</th>
<th>Ticker symbol</th>
<th>Allocation</th>
<th>Mgmt fee (bps)</th>
<th>Holdings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30%</td>
<td>70%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Equity ETFs**

- FTSE Canada All Cap Index ETF
  - Ticker: VCN
  - Allocation: 18%
  - Mgmt fee: 5 bps
  - Holdings: 247

- U.S. Total Market Index ETF
  - Ticker: VUN / VUS
  - Allocation: 23%
  - Mgmt fee: 15 bps
  - Holdings: 3,796

- FTSE Developed ex-North America Index ETF
  - Ticker: VDU / VEF
  - Allocation: 15%
  - Mgmt fee: 20 bps
  - Holdings: 1,402

- FTSE Emerging Index ETF
  - Ticker: VEE
  - Allocation: 4%
  - Mgmt fee: 23 bps
  - Holdings: 990

**Fixed income ETFs**

- Canadian Aggregate Bond Index ETF
  - Ticker: VAB
  - Allocation: 28%
  - Mgmt fee: 12 bps
  - Holdings: 539

- Global ex-U.S. Aggregate Bond Index ETF (CAD-hedged)
  - Ticker: VBG
  - Allocation: 7%
  - Mgmt fee: 35 bps
  - Holdings: 3,136

- U.S. Aggregate Bond Index ETF (CAD-hedged)
  - Ticker: VBU
  - Allocation: 5%
  - Mgmt fee: 20 bps
  - Holdings: 7,038

**Total**

- Allocation: 100%
- Mgmt fee: 15 bps
- Holdings: 17,148

Source: The Vanguard Group, Inc. Holdings based on Vanguard data as of December 31, 2014.

1 Equity allocations based on FTSE Global All Cap Index data and fixed income allocations based on Barclays Global Aggregate Float Adjusted Index as of December 31, 2014, rounded to the nearest 1%; analysis by Vanguard Investments Canada Inc.

2 Total management fee is asset-weighted.
ETF trading and liquidity basics
ETFs are like mutual funds that **trade** like a stock…

… but ETFs do not have the same **liquidity profile** as single stocks.

- **Mutual funds**
  - NAV priced once daily

- **ETFs**
  - Open-ended to facilitate supply/demand
  - Low expense ratios
  - Low turnover

- **Stocks**
  - Fixed number of units outstanding

- Continuous pricing intraday
- Trading flexibility on a stock exchange
Myth: Trading an ETF with low volume is dangerous because you could move the price.

• Fact: Unlike typical exchange-traded securities, ETFs do not have a fixed number of units outstanding and are therefore not subject to the same supply/demand liquidity profile.

• Fact: An ETF has two layers of liquidity:
  1. Exchange liquidity—the liquidity visible on all Canadian stock exchanges on which ETFs are traded.
  2. Secondary liquidity—the liquidity derived from the underlying securities in the ETF, which is captured through the **creation/redemption** process.
ETF liquidity is based on the underlying basket

<table>
<thead>
<tr>
<th>Stock</th>
<th>Amount required to create 1M units of ETF</th>
<th>30-day ADV ($)</th>
<th>Percentage of ADV traded per constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAIRFAX FINANCIAL HLDGS LTD</td>
<td>$163,436</td>
<td>$10,499,088</td>
<td>1.56%</td>
</tr>
<tr>
<td>RITCHIE BROS AUCTIONEERS</td>
<td>$39,758</td>
<td>$2,891,825</td>
<td>1.37%</td>
</tr>
<tr>
<td>EMPIRE CO LTD A</td>
<td>$32,816</td>
<td>$2,879,618</td>
<td>1.14%</td>
</tr>
<tr>
<td>CI FINANCIAL CORP</td>
<td>$69,681</td>
<td>$6,816,667</td>
<td>1.02%</td>
</tr>
<tr>
<td>WESTON (GEORGE) LTD</td>
<td>$62,137</td>
<td>$6,656,659</td>
<td>0.93%</td>
</tr>
<tr>
<td>CANADIAN UTILITIES LTD-A</td>
<td>$122,670</td>
<td>$13,528,347</td>
<td>0.91%</td>
</tr>
<tr>
<td>ONEX CORPORATION</td>
<td>$74,309</td>
<td>$8,326,672</td>
<td>0.89%</td>
</tr>
<tr>
<td>IGM FINANCIAL INC</td>
<td>$94,224</td>
<td>$10,839,069</td>
<td>0.87%</td>
</tr>
<tr>
<td>TORONTO DOMINION BANK</td>
<td>$1,446,081</td>
<td>$181,461,345</td>
<td>0.80%</td>
</tr>
</tbody>
</table>

Source: Vanguard illustration using data from Bloomberg Financial L.P.
This hypothetical example does not represent any particular investment. The data are provided for informational purposes only and are not intended for trading purposes.

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How market makers price ETFs
A market maker’s pricing of an ETF

Market maker costs (create)
- Basket ask
- Market conditions affect the basket spread
- Basket bid

Market maker costs (redeem)
- ETF ask
- ETF spread/Market price
- ETF bid

Market maker costs
- Operational costs to the market maker, such as commissions, hedging costs and trading fees; and related risks.
- Creation/redemption fee, which captures the custody bank’s fees for delivering securities into the portfolio. This fee may be absorbed by the manager, or charged to the market maker, and is derived from the number and domicile of the securities in the creation/redemption basket. Similarly, if cash is accepted in a creation or redemption, a fee may be charged to the market maker.
- Stamp taxes owed when buying or selling stocks in certain countries.

Source: The Vanguard Group, Inc. For illustrative purposes only.

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Bond ETF premiums and discounts
Theoretical pricing of a bond ETF

ETF ask

Market conditions affect the basket spread

ETF spread/Market price

Basket ask

Basket bid

ETF NAV

ETF bid

Source: The Vanguard Group, Inc. For illustrative purposes only.

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Theoretical pricing of a bond ETF

ETF bid

ETF spread/
Market price

Heavy buy volume
(Market makers create ETF shares)

Basket ask

Basket bid

Market conditions affect the basket spread

ETF NAV

Heavy sell volume
(Market makers redeem ETF shares)

ETF ask

Basket ask

ETF ask

ETF bid

ETF ask

ETF bid

Basket bid

Source: The Vanguard Group, Inc. For illustrative purposes only.
Premiums/discounts of a bond ETF

- Bond ETFs tend to have more consistent premiums and discounts because of the way bonds are priced in the ETF.
- The closing price of a Vanguard bond ETF is calculated as the midpoint of the best bid and best ask at 3:59 p.m. EST (third-party data providers use the last trade).
- Vanguard bond ETF NAVs are priced using the bids of the underlying bonds, consistent with the index pricing methodology (other ETF issuers and indexes may use midpoints).

Source: The Vanguard Group, Inc. For illustrative purposes only.
A market maker’s balance sheet
Market maker has 100 ETF units in inventory.

Market maker’s balance sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETF shares</td>
<td>Hedge</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Security 1</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Security 2</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Security 3</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Security 4</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Source: The Vanguard Group, Inc. For illustrative purposes only.
Market maker sells 150 ETF units to an investor and buys equivalent of 50 units in underlying stocks (#1-4).

<table>
<thead>
<tr>
<th>Market maker’s balance sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>ETF shares</td>
</tr>
<tr>
<td>Security 1</td>
</tr>
<tr>
<td>Security 2</td>
</tr>
<tr>
<td>Security 3</td>
</tr>
<tr>
<td>Security 4</td>
</tr>
</tbody>
</table>

Source: The Vanguard Group, Inc. For illustrative purposes only.
Market maker creates 50 ETF units using the equivalent in underlying stocks (#1-4) and settles its short ETF position.

Market maker’s balance sheet (continued)

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETF shares</td>
<td>ETF shares</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Security 1</td>
<td>25</td>
</tr>
<tr>
<td>Security 2</td>
<td>10</td>
</tr>
<tr>
<td>Security 3</td>
<td>10</td>
</tr>
<tr>
<td>Security 4</td>
<td>5</td>
</tr>
</tbody>
</table>
ETF structures and total cost of ownership
A “total cost of ownership” framework

Analyze ETFs by assessing all costs

One-time transaction costs

- Bid-ask spreads: Note the “effective spread”
- Commissions and other trading fees, if applicable

Ongoing costs

- Management expense ratio (MER)
- Trading expense ratio (TER)\(^1\): Includes portfolio commissions and other transaction costs \textit{not included} in the MER
- Foreign withholding taxes (FWT): Vary by replication structure
- Tracking error

Source: The Vanguard Group, Inc.

\(^1\) The trading expense ratio (TER) represents total commissions and other portfolio transaction costs expressed as an annualized percentage of daily average net assets. TERs are published on an annual and semiannual basis in the Management Reports of Fund Performance and/or prospectus. Each ETF’s total expenses are made up of the MER and the TER. Since Vanguard ETFs are index-based, each Vanguard ETF’s total expenses are substantially similar to the MER.
### A model for assessing costs related to ETFs

<table>
<thead>
<tr>
<th>Larger size</th>
<th>Smaller size</th>
<th>Shorter holding period</th>
<th>Longer holding period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stability of premiums/discounts</td>
<td>1</td>
<td>Ongoing expenses (MER, TER and FWT)</td>
</tr>
<tr>
<td>2</td>
<td>Basket liquidity (spread, creation fee)</td>
<td>2</td>
<td>Stability of premiums/discounts</td>
</tr>
<tr>
<td>3</td>
<td>Ongoing expenses (MER, TER and FWT)</td>
<td>3</td>
<td>Basket liquidity (spread, creation fee)</td>
</tr>
</tbody>
</table>

| 1 | Stability of premiums/discounts | 1 | Ongoing expenses (MER, TER and FWT) |
| 2 | Spread | 2 | Stability of premiums/discounts |
| 3 | Ongoing expenses (MER, TER and FWT) | 3 | Spread |

**Source:** The Vanguard Group, Inc.  For illustrative purposes only.
Cost components of international equity ETFs

Replication structure and impact to cost components

- **Indirect**: invests in U.S.-listed ETFs
  - Spreads: Lowest
  - TERs\(^1\): Lowest; typically 0.00%
  - FWT: Highest; not “double” the 15% U.S.-Canada withholding rate (1\(^{st}\) level of FWT for Vanguard Developed ex-NA = 7%)

- **Direct**: Invests directly in the underlying stocks
  - Spreads: Highest
  - TERs: Vary; examples range as high as 1.00%
  - FWT: Lowest

- **Hybrid**: utilizes a U.S.-listed ETF for creations, but ultimately holds primarily the underlying stocks
  - Spreads: Low
  - TERs: Vary; increase when experiencing positive cash flows
  - FWT: Low; benefit partially offset when portion of portfolio remains invested in U.S.-listed ETFs

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1 The trading expense ratio (TER) represents total commissions and other portfolio transaction costs expressed as an annualized percentage of daily average net assets. TERs are published on an annual and semiannual basis in the Management Reports of Fund Performance and/or prospectus. Each ETF's total expenses are made up of the MER and the TER. Since Vanguard ETFs are index-based, each Vanguard ETF's total expenses are substantially similar to the MER.
Trading best practices and key takeaways
Avoid market orders when possible, particularly at market open and close
• Use limit orders

All else equal, ETFs will trade with tighter quoted spreads when all of the underlying securities have begun trading
• Be cautious when trading near the open and close of the market
• For wrapped ETFs, be cautious when the U.S. market is closed
• For fixed income ETFs, be cautious when the stock market is open, but the bond market is closed or closes early (e.g. Remembrance Day, and the day before a full bond market holiday)

When making large trades, engage your block trading desk to review options such as:
• Creating or redeeming units; executing the trade in one block
• Implementing various executing strategies, such as volume-weighted average price (VWAP)
• Or call your sales executive and the ETF Capital Markets Team to review depth and trading strategies
ETF liquidity is not similar to single stocks

- ETFs are open-ended and new units can be created based on the liquidity of the underlying stocks or bonds.

In most cases, ETF pricing is anchored to the spread of the underlying basket

- The “cost of entry” into a particular ETF reflects similar costs to accessing the asset class through stocks / bonds directly, or through mutual funds.

ETFs should be analyzed with a total cost of ownership framework

- First, seek the exposure you need for the portfolio; then consider cost-related factors.
- One-time costs such as spreads amortize over the holding period and are less important for long holding periods.
- ETF replication structures result in trade-offs, primarily among spreads, TERs and FWT (which is typically inversely related to all other factors).
Appendix
Monitor all-in costs in basis points

All-in costs = MER + spread + commission
- Assuming commission is equal between any two ETFs, all-in cost = MER + spread

Spread should be evaluated in basis points (bps) not $
- $0.01 spread on $10 NAV = 10 bps > $0.02 spread on $25 NAV = 8 bps

MER and other ongoing costs drive cost leadership over the long term

<table>
<thead>
<tr>
<th>ETF</th>
<th>Bid</th>
<th>Ask</th>
<th>Spread ($)</th>
<th>Spread (bps)</th>
<th>MER (bps)</th>
<th>1-year all-in (bps)</th>
<th>3-year all-in (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETF A</td>
<td>$20.00</td>
<td>$20.04</td>
<td>$0.04</td>
<td>20</td>
<td>15</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>ETF B</td>
<td>$10.00</td>
<td>$10.01</td>
<td>$0.01</td>
<td>10</td>
<td>25</td>
<td>35</td>
<td>80</td>
</tr>
<tr>
<td>ETF C</td>
<td>$20.00</td>
<td>$20.01</td>
<td>$0.01</td>
<td>5</td>
<td>35</td>
<td>40</td>
<td>110</td>
</tr>
</tbody>
</table>

The hypothetical examples do not represent any particular investment. MER is subject to change.
The longer the holding period, the less important transaction costs become.

Consider break-even model when choosing among equivalent ETFs.

Source: The Vanguard Group, Inc. For illustrative purposes only. This hypothetical example does not represent any particular investment.
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**Monitoring and analytics**
- Intraday monitoring of trading in Vanguard ETFs
- Constant communication with on-screen market makers
- Working with exchanges to ensure fair trading environment

**Managing market maker environment**
- Facilitating and monitoring all primary market operations
- Ensuring market makers have the tools needed to price Vanguard ETFs
- Encouraging more dealers to price Vanguard ETFs

**Client execution support**
- Providing pre-trade and post-trade analysis as required
- Educating about Vanguard ETF liquidity, available methods of trading and expected cost components
- Navigating to existing pools of liquidity
Exchange liquidity

TSX
Alpha
Chi-X

TSX level 1 quote: 26.09-26.11

Better offer at 26.10 available on Alpha!

Source: Vanguard, Bloomberg Financial L.P.
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